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March 2017

# Acute and Chronic Stressor Mechanisms in Health Disparities

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Running Head: STRESSOR MECHANISMS IN HEALTH DISPARITIES

Acute and Chronic Stressor Mechanisms in Health Disparities

Christine Deidrich, Naomi Otoo, Ashlyn Bedard, Corey Coogan

Worcester Polytechnic Institute

IQP Project 2

### Abstract

The present study examined the relationship between the acute stress of receiving a simulated microaggression, and acute and chronic physiological parameters. Prior research has shown women, minorities, and foreign-born individuals are more likely to experience these microaggressions daily compared to caucasian counterparts. College campuses nationwide have worked to enact policies and trainings to mitigate the effects of microaggressions on college campuses, but they are not necessarily effective. Self-reported surveys were used as measures of subjective social status as well as frequency of perceived microaggressions. The team found in prescreening results that on the WPI campus, females, commonly in male-dominated engineering fields, perceived that they were discriminated against more frequently than their male counterparts.

### Acute and Chronic Stressor Mechanisms in Health Disparities

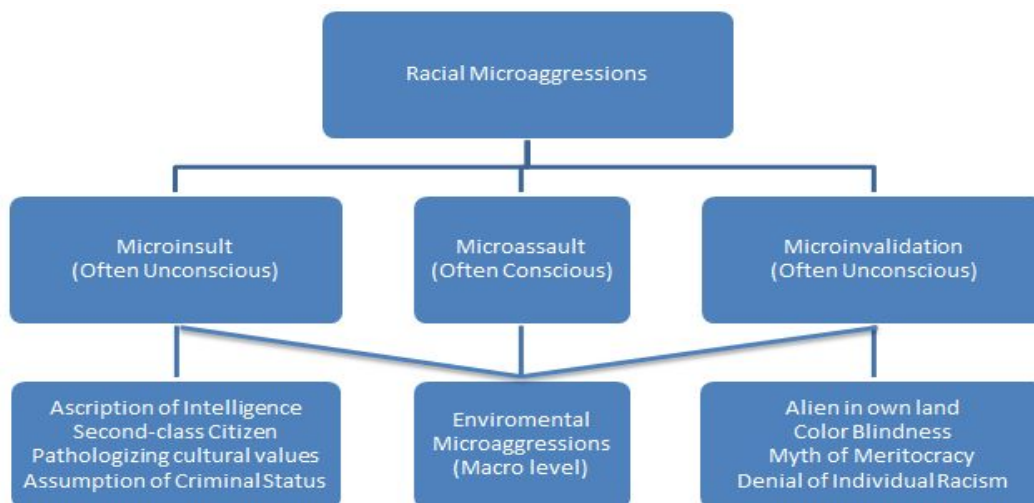
Microaggressions have been studied since the 1970's when a Harvard University professor and psychiatrist first named the concept (DeAnglis, 2009). The term was originally used to describe brief everyday exchanges that imply denigrating messages about minorities, particularly African-Americans. The topic was later expanded to encompass the subtle social devaluation and aggressions directed at many other groups including women, religious groups, and other minorities (Sue, 2010). This poses an important issue as modern society's media claims that racism no longer exists, however, the chronic experience of perceiving microaggressions suggests that there is a large portion of the population that still has implicit biases (Sue, 2010).

There have been many studies conducted regarding the psychological processes associated with microaggressions in an effort to obtain a better understanding of why they happen and who is most likely to be the recipients or perpetrators. A study conducted by Solorzano (2000) investigated microaggressions on college campuses; the researchers investigated the frequency of these experiences for students and the effects it had on their campus environment. The researchers found that African-American students in the study self-reported that they frequently felt invisible on campus and professors tended to act as if their concerns were not as pressing (Solorzano, 2000). The study showed that African-Americans experienced microaggressions on a daily basis while attending college. For example, African-American students self-reported that professors had lower expectations of them and racial segregation was apparent in class study groups. Researchers have also studied how often microaggressions occur regarding one's sex. A study conducted in 2009 found that women who

were pursuing a major in a predominantly male field were more likely to experience subtle insults that were related to their gender being viewed as inferior (McCabe, 2009).

Someone who commits microaggressions is usually unaware that he or she is engaging in such behaviors in their interactions with racial or ethnic minorities (Sue, 2007). There are three different ways microaggressions can manifest according to Sue (2007): microassaults, microinsults, and microinvalidations. Microassaults are discriminatory actions, such as a verbal attacks or avoidant behavior. Subtly conveyed rudeness and insensitivity that demeans a person's racial heritage or identity is known as microinsult. A microinvalidation is a verbal or nonverbal remark that invalidates the experience of a minority culture (Sue, 2007).

Racial microaggressions have nine common themes: alien in one's own land, ascription of intelligence, color blindness, assumption of criminality, denial of racism, myth of meritocracy, pathologizing cultural norms, second-class citizenship, and environmental invalidation. (Sue, 2007). A brief explanation and examples of implicit and explicit microaggressions are shown below in Table 1.



*Figure 1: Hierarchy of Microaggression types and themes (Sue, 2007)*

<b><u>Theme</u></b>	<b><u>Microaggression Example</u></b>	<b><u>Message</u></b>
Alien in own land	“You speak English well.”	You are not American, you are a foreigner
Ascription of intelligence	“You are a credit to your race.”	It is unusual for someone of your race to be intelligent
Color blindness	“When I look at you, I don’t see color.”	Denying a person of color’s racial/ethnic experiences.
Criminality/assumption of criminal status	A store owner following a customer of color around a store	You are going to steal because you are poor. You are a criminal.
Denial of individual racism	“I’m not racist. I have several Black friends.”	I am immune to racism because I have friends of color.
Myth of meritocracy	“I believe the most qualified person should get the job.”	People of color are given extra unfair benefits because of their race.
Pathologizing cultural norms	Saying to a black person: “Why are you so loud/ why don’t you just calm down?” Dismissing an individual who brings up race/culture in a work/school setting.	Assimilate to dominant culture
Second-class citizen	Person of color mistaken for a service worker	People of color are servants to Whites, they couldn’t possibly hold high-status positions.
Environmental invalidation	TV shows or movies with predominantly White characters and no or negative representation of people of color.	You are an outsider, you don’t exist.

*Table 1: Example of Microaggressions (Sue, 2007).*

Most studies related to microaggressions tend to investigate superficial problems such as the circumstances under which microaggressions are likely to occur (Solorzano, et al., 2000; Yosso, et al., 2009). They usually do not consider the potential long-term psychological and physiological consequences of chronic social devaluation. The present study investigates the acute physiological stress response people have when they are the recipient of a simulated microaggression statement in a lab setting. Other studies have most accurately measured acute stress using a steroid hormone in saliva called cortisol (Kirchbaum, 1992). Cortisol is a hormone secreted by the body in the presence of a stressing stimulus as part of the “Fight or Flight” response (Kirchbaum, 1992). Unique to the present study, to measure chronic stress and acute stress, hair cortisol and salivary cortisol, respectively, are measured and examined as associated with the frequency of experiencing microaggressions. The chronic and acute stress that individuals experience can have negative impacts throughout their lives (Gee, et.al., 2007; Krieger, 1990; Habibzadeh, 2015; Wong, et.al., 2013).

### *Biomarkers of Stress*

A recently established biomarker of chronic stress is measuring levels of hair cortisol concentrations (HCC; Russell, 2012). The present study will collect hair to be assayed for HCC (O’Brien, 2016). Researchers have found many ways to measure cortisol associated with acute stress, however, there are few well-established ways to measure chronic stress (Russell et al., 2012). Chemical assays on hair have been conducted in the past to measure levels of drugs in cases of addiction; researchers established HCC to assess cortisol secretion retrospectively for up to three months of chronic stress (Russell et al., 2012). One of the benefits of assaying hair is that it provides a measure of approximately 3 months of circulating cortisol secretions, as each

centimeter is approximately one month's worth of cortisol secretion.

Chronic and acute stressors that individuals experience can have negative impacts throughout their lives. Individuals that receive cumulative discrimination through microaggressions can experience excessive levels of stress either acutely or chronically (Wong et al., 2013). While acute stress may only be temporary, numerous issues, such as severe headaches and potentially fatal heart attacks, can present themselves (Krantz, 2011). Chronic stress can also lead to psychological disorders, respiratory problems, and many other physical health risks (Wong et al., 2013). In extreme cases, some develop a suppressed immune system that opens doors to many infectious diseases (Habibzadeh, 2015).

#### *Cardiovascular Response to Stress*

One of the most notable consequences of prolonged social stress is the body's cardiovascular response. From a biological standpoint, stress can increase the body's heart rate and blood pressure putting added stress on major arteries (Mall et al, 2007). This results in a decay of vessel walls in the cardiovascular systemic circuit (Marieb et al, 2013). Some anxiety disorders have been linked to aortic aneurysms and other pulmonary diseases as a consequence of chronic stress (Mall et al, 2007).

Furthermore, in a racial discrimination stress study done in the US, Asian Americans were given a self-report survey asking questions on past racial discrimination and if they have experienced any health issues (Gee et al., 2007). The subjects were asked to rank their health on a scale of 0 to 10 (0 being the worst and 10 being the best) in four different categories (Gee et al., 2007). The type of health issues were categorized as either cardiovascular, respiratory, physical pain, or other (Gee et al., 2007). The reports from the subjects suggested that discrimination was



a significant predictor to cardiovascular diseases and that the two are closely linked (Gee et al., 2007). A similar study was conducted with the same style of self-report surveys. The study focused on hypertension as a consequence of race and sex discrimination (Krieger, 1990). The results suggested that both types of discrimination contributed to hypertension, however racial discrimination had a greater correlation (Krieger, 1990). Notably, assessments of actual acts of discrimination or perceived discrimination appear to have the same deleterious outcomes on psychological and physical health.

#### *Subjective and Objective Status and health*

Subjective Social Status (SSS) is defined as a person's belief about his or her ranking in a status order (Davis, 1956), referring to a person's perceived place in a socioeconomic structure. SSS is a way for researchers to assess a participant's perceived value in his or her community that is based on subjective rather than objective indicators. This can often be assessed in a lab setting by using a ladder where participants rank where they see themselves in the community based on marking a rung of the ladder (Adler, et al., 2000). SSS can also have an effect on a person's long-term health in a similar way as constant stress (Davis, 1956). People who feel constantly stressed or under pressure can maintain a state of hypervigilance in which they are more susceptible to subtle stressors such as microaggressions (Grisart, 2002). Alternatively, feelings of security and hope that are derived from perceptions of high social status can act as a buffer to the subtle stressors in society (Operario et al., 2004).

Moreover, the interrelationship between subjective social status and participants' physiological measures when they are the recipient of a simulated microaggression is also being investigated. It is predicted that several associations will emerge: 1) women will be more likely

to experience an increased heart rate when receiving the microaggression when compared to males 2) people with higher SSS will likely have an insignificant physiological response to the simulated microaggression 3) people with lower SSS will be likely to experience a strong physiological response to the simulated microaggression. Researching SSS as well as chronic stress, we predict that interrelationships between SSS and physiology will indicate which sex and race/ethnicity is most likely to have a significant stress response to microaggressions.

Extrapolating from past studies, people with high chronic stress are expected to experience an increased acute stress response when subjected to microaggressions. In addition, it is predicted that there will be cumulative or additive effects: African-Americans are hypothesized to have higher HCC compared to other racial groups due to more frequent discrimination and experience of microaggressions (Solorzano, 2000). Women are hypothesized to have higher salivary cortisol measures due to more frequent variations in hormone levels that leave them more susceptible to stressors. (Rosch, 2016).

The potential benefits of this study include creating the opportunity to open conversations and further research about the overwhelming presence of microaggressions in modern society and the long-term effects of these subtle stressors on the overall health of affected groups. From this, the team will prepare presentations to educate campus populations about microaggressions and their effects on not only individuals, but the campus environment as a whole.

## **Method**

### **Recruitment**

Participants for this study will be recruited from the WPI community and Worcester area using online forums and flyers dispersed amongst local cafes and community spaces. The ideal participant pool for this study would be approximately 200 people ages 18-40 consisting of 50%

each sex, with a large emphasis on minority populations. The people who respond to the postings will be prescreened for cardiovascular issues as well as for any medications that may alter Hypothalamus Pituitary Adrenal Axis (HPAA) assessment. The participants will be asked to complete a survey evaluating perceived stress (Phillips, 1995; Appendix A), basic sociodemographic information, an assessment of daily and lifetime discrimination (Appendix B, Appendix C), and The Racial Microaggressions Scale (RMAS; Torres-Harding, et al., 2012, Appendix D).

### **Measures**

**Hair Cortisol** Hair samples will be taken using surgical scissors to cut approximately 100 strands of hair that are a minimum of 3 cm long from the posterior vertex. This hair will be placed in a piece of aluminum foil with the scalp end clearly marked. It will then be placed into a plastic bag with the subject ID and stored for later assay. Since hair grows approximately 1 cm per month, 3 cm is posited to capture retrospectively circulating cortisol for the past three months (Meyer, et al., 2014). As we are still collecting data, the hair cortisol measure is not yet included in these analyses.

**Salivary Cortisol** Saliva samples will be taken by having the participant chew on a cotton roll within a salivette for two minutes. The roll will be placed back into the salivette containing their subject ID and stored in a freezer for later assay. Cortisol levels will rise in saliva shortly after a person experiences a stressor so it will be used to measure the participant's acute stress response (Kirschbaum 1994).

**Lifetime Discrimination** (This was adapted by adding one question referring to higher education advising; Williams et al., 2008; McNeilly et al., 1996). This 12-item scale assesses the

lifetime frequency of discrimination experiences across multiple domains including work, school, receiving services, and public life. For example, ‘How many times in your life were you discouraged by a teacher or advisor from seeking higher education?’ Respondents answer on a Likert scale from 0-4, where each anchor represents 1-2 instances. Respondents answered using similar anchors as above and the same open item question. For the following measures, items were reverse scored such that higher total values reflect higher endorsement of the construct assessed. One additional item was open and asked “Why” the participant felt that they were discriminated (e.g., race/ethnicity, sex, weight, nativity, sexual orientation, or other as an open-ended response).

**Racial Microaggression Scale (RMAS;** Torres-Harding, et al., 2012, Appendix D). This scale was developed to assess the themes and categories of racial microaggressions. Four items assess the theme alien in own land, five items assess the theme ascription of intelligence, and four items assess the themes color-blindness and denial of individual racism. The next five items assess the theme criminality/assumption of criminal status, the following seven quantify the theme exoticized, five items assess the theme myth of meritocracy, and seven items measured pathologizing cultural values and communication styles. The next three items assessed the theme second-class citizenship, five items were developed to assess the theme environmental invalidations. A final set of five items was derived from Franklin and Boyd-Franklin’s (2000) conceptualization of invisibility. Each of these questions were answered on a scale of frequency ranging from 1 to 7, where one was “I did not experience this event”, and seven was “I experience this event 3 times a day”.

**Personal Perceived Stress (PSS;** Cohen & Williamson, 1988). The PSS is a standard

validated subjective stress measure, which includes 10 items. The questions in this scale ask about your feelings and thoughts. The wording was modified to assess perceived stress over the past three months. Respondents answer on a Likert scale from 1-5, where 1 = never and 5 = very often.

**Chaos, Hubbub, and Disorder (CHAOS)** (Matheny, Wachs, Ludwig & Phillips 1995). This reliable and validated 15-item measure assesses chaos/order of the home environment. For example, 'You can't hear yourself think in our home.' Respondents answer on a Likert scale from 1-4, where 1 =strongly agree and 4 = strongly disagree.

#### Status Measures

**Subjective Social Status (SSS)** (SSS; Operario, Adler, & Williams, 2004). The subjective status ladder was administered. Specifically, participants are presented an image of a ladder of ten rungs and are asked to rate themselves in terms of their social standing in the community, where 1 is the lowest and 10 is the highest rank.

**Positive and Negative Affect Scale (PANAS)** The Positive and Negative Affect Scale (PANAS) form will be administered at three occasions throughout the study to assess mood. Participants are asked to rank words describing different feelings and emotions that they could be feeling right now on a Likert scale from 1 to 5 where 1 is feeling very little and 5 is extremely feeling.

**SF-36 Questionnaire** The SF-36 Questionnaire assesses participants' general health by having them rank general health using things such as limitations of activities, general mental health and emotional experience, and pain. These are rated on various scales.

**Health Assessment Intake** The participant will fill out a health assessment intake which

includes overall health and wellbeing, as well as menstrual (to assess follicular cycle), sleep quality, and questions regarding rumination.

### Physiological Measures

**Waist and Hip Measurements** Measurement of the waist and hip ratio (WHR) will be taken using a medical tape measure. These measurements will be used to compute a waist/hip ratio to approximate general health as WHR is linked to risk factors of development of cardiovascular illnesses later in life (Dobbelsteyn, et al., 2001).

**Electrocardiogram (ECG)** Using a Lead II configuration, participants will have 3 ECG electrodes attached to them; a positive and a negative lead will be attached to either lower arm and a ground lead will be attached to the ankle as shown in Figure 1. These signals will be interpreted by ADInstruments PowerLab and LabChart software (ADInstruments, CO). This procedure is considered comfortable with low to no risk to the participant.

**Respiratory Belt** A respirator belt will also be wrapped snugly around participants' waists. This procedure is also considered comfortable with no risk to the participant.

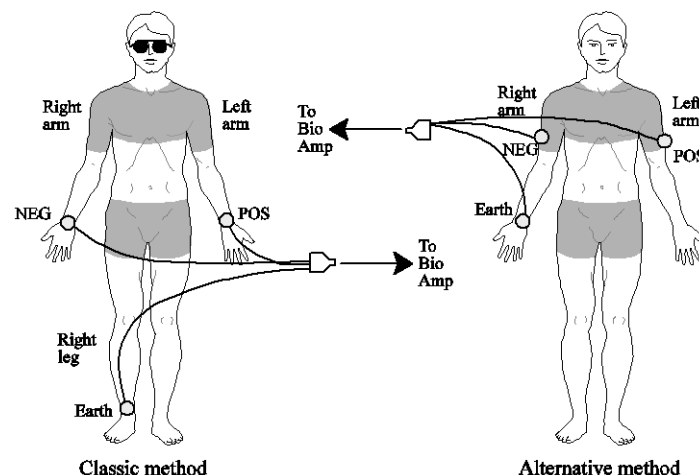


Figure 1. Connecting the electrodes to the participant; two alternative methods.

### Procedure

Upon arrival to the appointment, the experimenter will explain the basic premise of the study and obtain informed consent. The informed consent includes information on the length of the study, the hair cortisol collection procedure and the placement of sensors, the surveys, the cooperation task, and payment for participation (either \$20.00 or 1.5 units course credit). It will be emphasized at this point that participants may decide to discontinue the study at any time without any penalty to themselves.

### **Interaction partner**

Participants will then be introduced to the confederate, who will have false ECG sensors attached and act as though they are another participant in the study. The experimenter will then explain the instructions of the cooperative game that the confederate and participant will play together. For every round that the participant and confederate make 10 matches, the participant will get \$0.50 for up to \$2.00 extra. After four rounds have been played, the experimenter will separate the confederate and the participant to perform interviews in different rooms. The experimenter will ask the following questions to the participant:

- 1) How well did you work together, in your opinion?
- 2) Was your partner easy to work with?
- 3) Is your partner someone your friends would like?
- 4) How did you feel with the timed task? If you felt more pressure with the timer, did it help to have a partner?
- 5) Was there one thing about working with your partner that you liked the most or the least?
- 6) Any other general comments?

The confederate will have a scripted response containing race-related microaggressions to these questions that will-be pre-recorded. The confederate will also be asked if he or she would like to play a bonus round with the participant; the scripted response will be no, they would not

like to.

Before participants listen to this recording, they will fill out another PANAS. With the experimenter out of the room the recording will be played. Once the recording is over, the experimenter will re-enter the room and ask participants whether they would like to play another round with the confederate. The answer to this question will be noted, but overall irrelevant because the confederate will have already declined a bonus round. The participants will then complete the third PANAS as well the HF36 health survey to assess physical health and symptoms.

Once participants have completed the surveys, the debriefing begins. During this time, the experimenter will reveal everything about the study including the actual intent of the study. Experimenters will pay close attention to any distressed body language coming from participants. It will be emphasized that the interview was scripted and the confederate's behavior is strictly scripted as we are hoping to assess naturally occurring responses to hearing a microaggression. The confederate will be introduced to the participants and again be reassured that all behavior was predetermined. The experimenter will answer any questions that participants may have. After the debriefing is complete, participants will fill out the final PANAS and sensors will be removed.

## **Results**

### **Analytic plan**

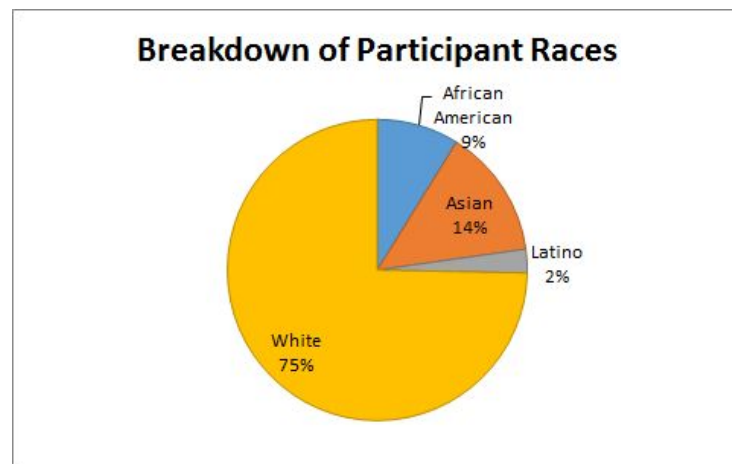
IBM's SPSS version 19 statistical software was used to perform statistical analysis to determine whether the dependent variables were indeed predicted by perceived discrimination experiences. The dependent variables measured included perceived stress, microaggressions and



daily discrimination. Our independent measures included class year in college and sex. The following are trends for the collected data. Values will be higher than  $p < .05$  or  $p = .10$ .

*Data Set One: Self-reported Indices*

The participant pool consisted of 75% Caucasians, 14% Asians, 9% African Americans, and 2% Latinos. While this is not a very diverse sample, it is representative of the proportions of races present on WPI's campus.



*Figure 1. Breakdown of Participant Races*

A t-test was used to determine the interactions between sex and daily discrimination and microaggressions. Analysis of Variance (ANOVA) was used to determine the interactions of class year with the dependent variables: perceived stress, microaggressions, and daily discrimination.

**Sex**

This first model produced the main effect of sex on microaggressions reported on the RMAS and daily discrimination. Female ( $M=42.64$ ,  $SD=4.73$ ) and male ( $M=29.22$ ,  $SD=6.67$ ) conditions;  $t(77)=0.65$ ,  $p=0.52$ . It is worth noting that females reported higher levels of perceived stress and microaggression.

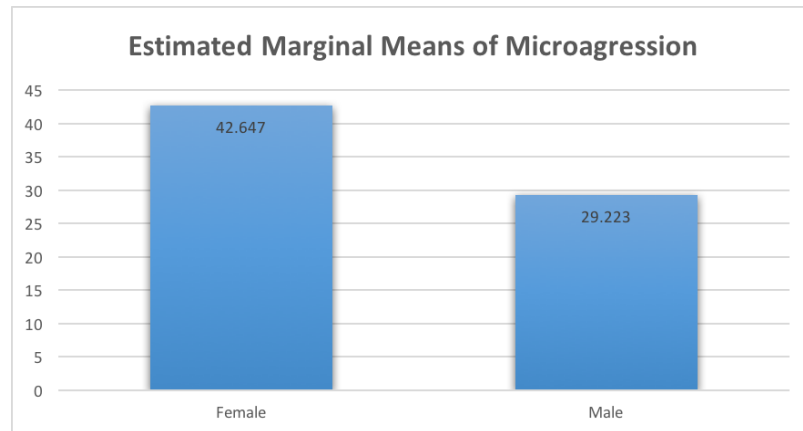


Figure 2. Estimated Marginal Means of Microaggressions in Males and Females.

The next model contained the relation between sex and daily discrimination. Female ( $M=20.26$ ,  $SD=21.73$ ) and male ( $M=16.43$ ,  $SD=1.80$ ) conditions;  $t(77)=0.96$ ,  $p=0.34$ ). Both numbers were high daily means, but females still reported higher.

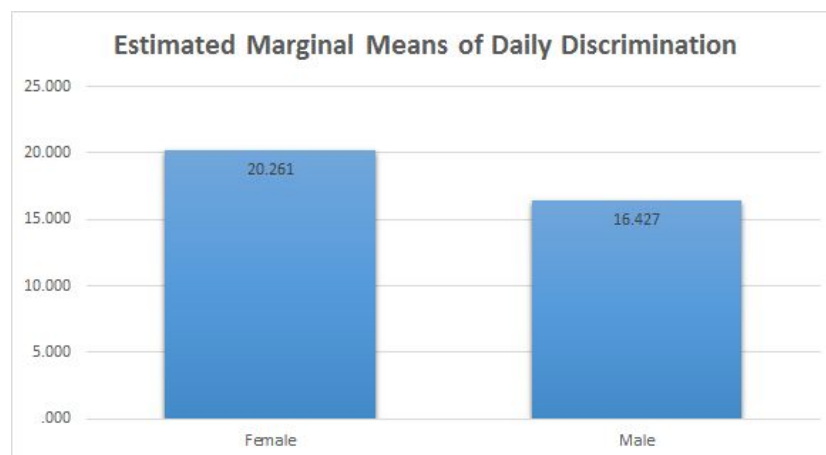
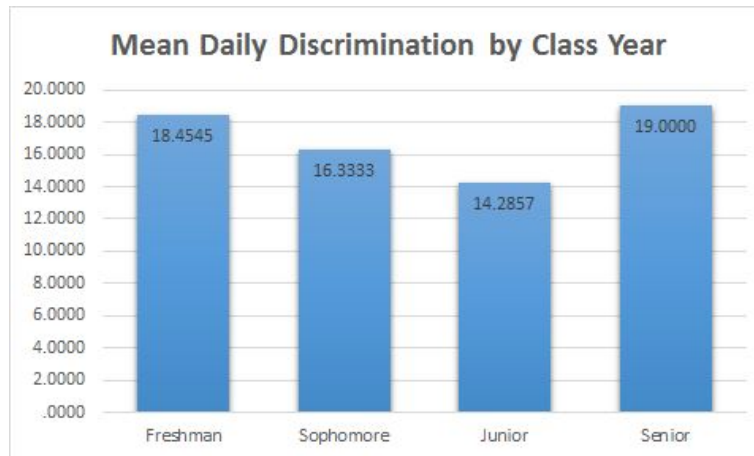


Figure 3. Estimated Marginal Means of Daily Discrimination in Males and Females.

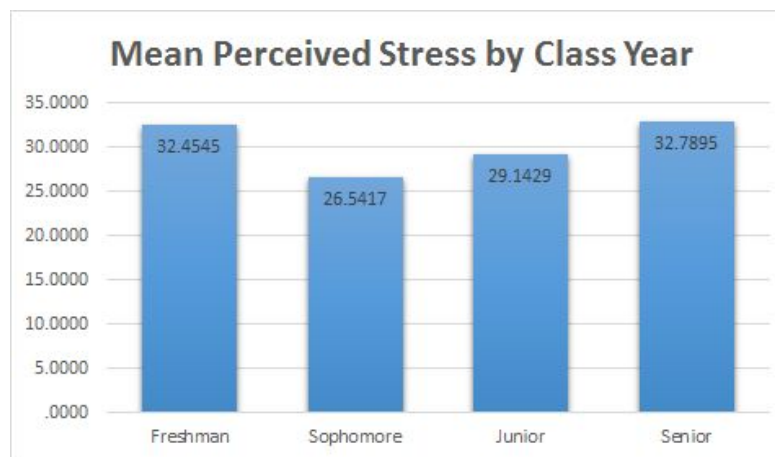
### Class Year

When looking at college class year, Daily Discrimination results were reported as such: freshman ( $M=18.45$ ,  $SD=5.71$ ), sophomore ( $M=16.33$ ,  $SD=5.25$ ) junior ( $M=14.28$ ,  $SD=4.71$ ) and senior ( $M=19.00$ ,  $SD=6.05$ ) conditions;  $t(77)=0.96$ ,  $p=0.34$ ;  $t(77)=0.96$ ,  $p=0.34$ . Freshmen and seniors reported the highest daily discrimination, followed by sophomores, and then juniors.



*Figure 4.* Comparisons of College Class Year and Daily Discrimination

When looking at college class year, PSS results were reported as such: freshman ( $M=32.23$ ,  $SD=30.49$ ), sophomore ( $M=40.00$ ,  $SD=25.14$ ), junior ( $M=28.71$ ,  $SD=17.16$ ) and senior ( $M=40.73$ ,  $SD=18.64$ ) conditions;  $t(77)=0.95$ ,  $p=0.34$ ;  $t(77)=0.64$ ,  $p=0.52$ . Again, freshman and seniors reported the highest levels, followed by sophomores, and then juniors.



*Figure 5.* Comparisons of College Class Year and Perceived Stress

When looking at college class year, RMAS results were reported as such. Freshman ( $M=32.45$ ,  $SD=6.47$ ), sophomore ( $M=26.54$ ,  $SD=6.57$ ), junior ( $M=29.14$ ,  $SD=5.13$ ) and senior

( $M=32.77$ ,  $SD=6.85$ ) conditions;  $t(77)=0.96$ ,  $p=0.34$ ;  $t(77)=-0.15$ ,  $p=0.88$ . In this measure, sophomores and senior reported highest.

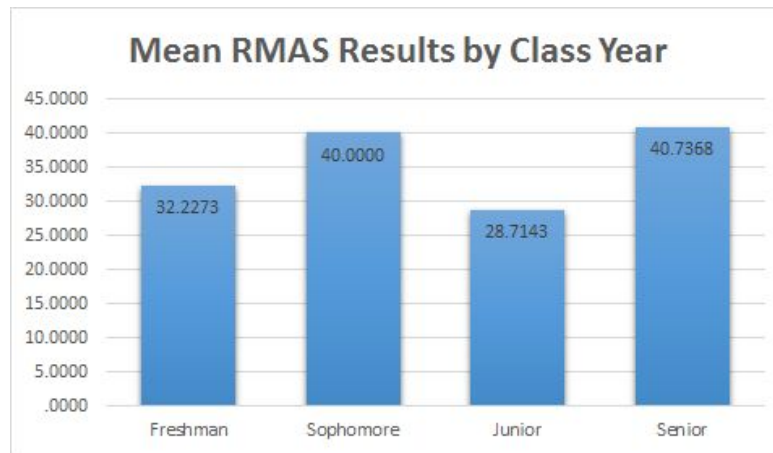


Figure 6. Comparisons of College Class Year and RMAS results

### Correlations

		PSS	Daily Discrimination	RMAS
PSS	Pearson Correlation	1	.45	.02
	Sig. (2-tailed)		.000	.85
	N	79	79	79
Daily Discrimination	Pearson Correlation	.45	1	.45
	Sig. (2-tailed)	.000		.000
	N	79	79	79
RMAS	Pearson Correlation	.02	.45	1
	Sig. (2-tailed)	.85	.000	
	N	79	79	79

Table 1. Correlations between PSS, Daily Discrimination, and RMAS

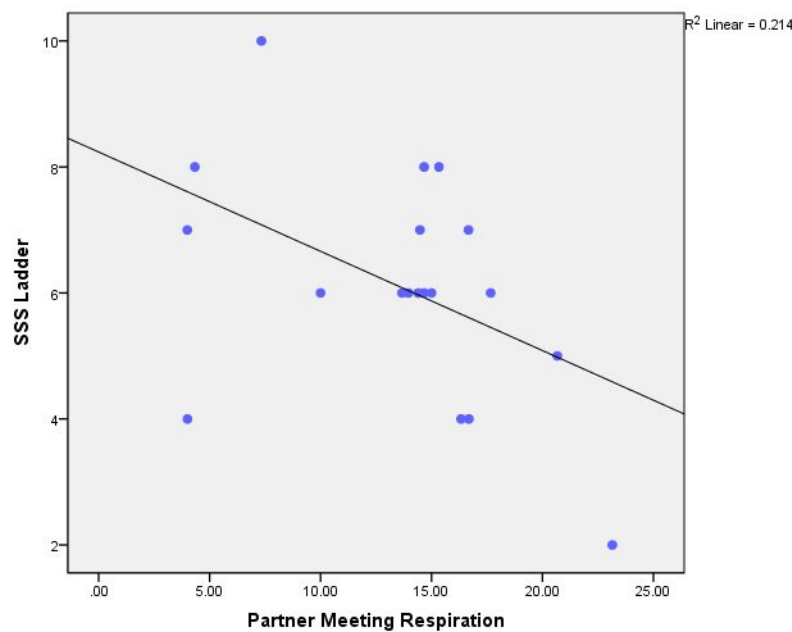
The above table shows the correlations between the PSS, daily discrimination, and the RMAS. There was a positive correlation between PSS and daily discrimination  $r=0.45$ ,  $n=79$ ,

$p = 0.00$  and RMAS and daily discrimination had a correlation of  $r = 0.45$ ,  $n = 79$ ,  $p = 0.00$ . The association between RMAS and PSS was notably weaker, resulting in only a  $r = 0.02$ ,  $n = 79$ ,  $p = 0.85$  correlation.

#### *Data Set Two: Physiological Indices*

The participant pool consisted of 85% Female, and 15% Male. It is important to note that this is not a normal distribution. For this part of the study, there was a smaller subject pool than the preliminary data ( $N=33$ ).

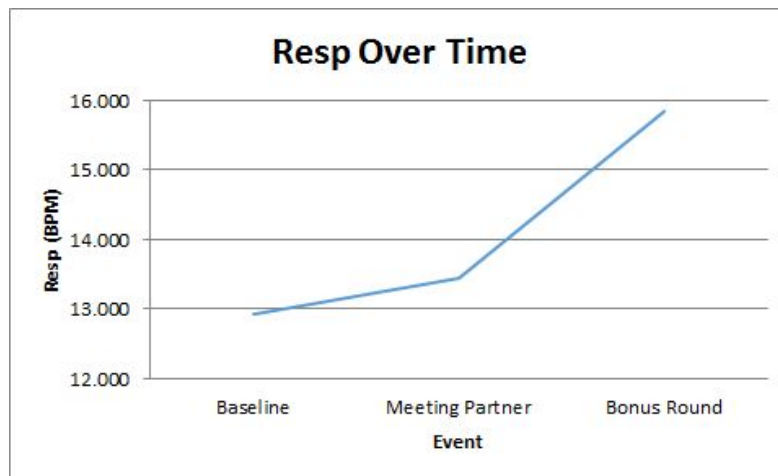
Respiration rate throughout the study was significantly different at the measured point. Specifically at the partner meeting, there was a strong negative correlation between the self-reported SSS ladder and the respiration (breaths per minute) measured ( $r^2=.214$ ).



*Figure 7.* Relationship between SSS and Partner Meeting Rep.

Figure 8 illustrates the change in respiration at different measured points over the course of the study. The first point is baseline, the second is when the participant is meeting their

partner for the first time, and the third is when the participant is asked if they would like to play a bonus round.



*Figure 8. Respiration Over Time*

We did investigate cardiovascular differences over time, the results were not significant.

### **Discussion**

We predicted that several associations would emerge: 1) women would be more likely to experience an increased heart rate when receiving the microaggression when compared to males 2) people with higher SSS would likely have an insignificant physiological response to the simulated microaggression 3) people with lower SSS would be likely to experience a strong physiological response to the simulated microaggression. The results this experiment yielded showed women reporting higher daily discrimination as well as more frequent exposure to microaggressions. This result is somewhat surprising as WPI has multiple student and faculty led initiatives that are designed to make women feel more comfortable in the predominantly male fields. However, the findings still show females experience more discrimination and microaggressions on a daily basis than males. These results could be related to women being a

significant minority population as well as an antiquated rhetoric that still exists on campus, particularly in the classroom environment.

When looking at the relationship between different class years and their reported results, the findings showed seniors experienced the most daily discrimination and microaggressions as well as the highest perceived stress. This provides further evidence that seniors at WPI experience a great amount of stress. This could be attributed to trying to find a career path as well as completing the Major Qualifying Project, required for graduation. Dealing with potential employers could expose them to various microaggressions as it is common for them to be treated with less respect than established employees. Freshmen reported the second highest in both daily discrimination and perceived stress. These findings could be related to many first year students coming from small schools and having to adapt to a much larger student population. Their reported stress levels and daily discrimination may also be due to the increased workload that college academics demand. It is important to note that while juniors and sophomores reported lower levels in daily discrimination and perceived stress, the results were still higher than hypothesized. The findings from this experiment showed that students on WPI's campus experience chronic stress and discrimination on an everyday basis. While experiencing stress and discrimination may not be unique to one college campus, the level at which it was reported was significantly higher than expected.

The measures of daily discrimination, perceived stress, and microaggression had different correlations emerge. Perceived stress and daily discrimination showed the strongest positive correlation ( $r = .45$ ). This is notable because it supports the idea that people who are exposed to more daily discrimination are likely to experience higher chronic stress. Daily discrimination

also correlated strongly with the racial microaggression scale which is logical as a microaggression is a form of discrimination. In addition, it was evident that the perceived stress and the racial microaggression scale had almost no correlation. The weak association could be due to microaggressions commonly being a mistake without malicious intentions behind them unlike most types of discrimination.

The team hypothesized that women would be more likely to experience an increased heart rate when receiving the microaggression when compared to males. When looking at the results from the physiological data that was collected, it was found that women did experience an increased heart rate when exposed to the microaggression as was hypothesized. While the team hypothesized that people with higher SSS would likely have an insignificant physiological response to the simulated microaggression and people with lower SSS would be likely to experience a strong physiological response to the simulated microaggression. However, it was determined that the data was not statistically significant enough to make a judgment on how SSS affected the participant's physiological response to the microaggression. A negative correlation was found between certain physiological data and where the participants put themselves on the SSS ladder; participants who placed themselves high on the ladder tended to have a higher respiration rate when being introduced to the partner for the game. This evidence refutes the idea that people with higher social subjective status will usually have a lesser acute stress response when meeting a new person. However, this does suggest that a high SSS acts as a protective measure in stressful situations.

The racial microaggression that was used in the study did not affect a majority of the study participants as they were Caucasian. This could have influenced the lack of statistically



significant findings in the physiological data. This study was also run with a relatively small number of participants in a short period of time. A lengthier, more diverse study could increase the accuracy of the data and could reveal more correlations with further data analysis.

### **Conclusions**

The present findings add to the body of evidence indicating that discrimination is a chronic stressor. Moreover, these findings inform college administration and other leaders that their efforts in minority inclusivity while constructive, are far from ending the inequality that minorities experience daily.

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## Appendix A

## Perceived Stress Scale (PSS)

- 1) In the past week, how often have you been upset because of something that happened unexpectedly?

*1 never                      2 almost never                      3 sometimes                      4 fairly often                      5 very often*

- 2) In the past week, how often have you felt that you were unable to control the important things in your life?

*never                      almost never                      sometimes                      fairly often                      very often*

- 3) In the past week, how often have you felt nervous and stressed?

*never                      almost never                      sometimes                      fairly often                      very often*

- 4) In the past week, how often have you felt confident about your ability to handle your personal problems?

*never                      almost never                      sometimes                      fairly often                      very often*

- 5) In the past week, how often have you felt that things were going your way?

*never                      almost never                      sometimes                      fairly often                      very often*

- 6) In the past week, how often have you found that you could not cope with all the things that you had to do?

*never                      almost never                      sometimes                      fairly often                      very often*

- 7) In the past week, how often have you been able to control irritations in your life?

*never                      almost never                      sometimes                      fairly often                      very often*

- 8) In the past week, how often have you felt that you were on top of things?

*never                      almost never                      sometimes                      fairly often                      very often*

- 9) In the past week, how often have you been angered because of things that happened that were outside of your control?

*never                      almost never                      sometimes                      fairly often                      very often*

- 10) In the past week, how often have you felt difficulties were piling up so high that you could not overcome them?

*never                      almost never                      sometimes                      fairly often                      very often*

## Appendix B

**Daily Discrimination**

How many times daily have you been discriminated against in each of the following ways because of such things as **your race, ethnicity, gender, age, religion physical appearance, sexual orientation, or other characteristics**? After you answer each question, please tell us why you felt discrimination (e.g., the list above). You can name more than one characteristic.

**For example: Often, Why: sexual orientation.**

- |  |                  |                      |                   |                  |
|--|------------------|----------------------|-------------------|------------------|
| 1. Are you treated with less courtesy than other people?                     | <b>(1) Often</b> | <b>(2) Sometimes</b> | <b>(3) Rarely</b> | <b>(4) Never</b> |
| 2. Are you treated with less respect than other people?                      | <b>(1) Often</b> | <b>(2) Sometimes</b> | <b>(3) Rarely</b> | <b>(4) Never</b> |
| 3. Do you receive poorer service than other people at restaurants or stores? | <b>(1) Often</b> | <b>(2) Sometimes</b> | <b>(3) Rarely</b> | <b>(4) Never</b> |
| 4. Do people act as if they think you are not smart?                         | <b>(1) Often</b> | <b>(2) Sometimes</b> | <b>(3) Rarely</b> | <b>(4) Never</b> |
| 5. Do people act as if they are afraid of you?                               | <b>(1) Often</b> | <b>(2) Sometimes</b> | <b>(3) Rarely</b> | <b>(4) Never</b> |
| 6. Do people act as if they think you are dishonest?                         | <b>(1) Often</b> | <b>(2) Sometimes</b> | <b>(3) Rarely</b> | <b>(4) Never</b> |
| 7. Do people act as if they think you are not as good as they are?           | <b>(1) Often</b> | <b>(2) Sometimes</b> | <b>(3) Rarely</b> | <b>(4) Never</b> |
| 8. Are you called names or insulted?   | <b>(1) Often</b> | <b>(2) Sometimes</b> | <b>(3) Rarely</b> | <b>(4) Never</b> |
| 9. Are you threatened or harassed?   | <b>(1) Often</b> | <b>(2) Sometimes</b> | <b>(3) Rarely</b> | <b>(4) Never</b> |



## Appendix C

**Lifetime Discrimination**

How many times in your **LIFE** have you been discriminated against in each of the following ways because of such things as your ***race, ethnicity, gender, age, religion physical appearance, sexual orientation, or other characteristics***? After you answer each question, please tell us why you felt discrimination (e.g., the list above). You can name more than one characteristic.

**For example: Number of times: 20, Why: female.**

1. Were you discouraged by a teacher or advisor from seeking higher education?

**Number of Times:** \_\_\_\_\_

2. Were you discouraged by a teacher or advisor from seeking higher paying work?

**Number of Times:** \_\_\_\_\_

3. Were you denied a scholarship?

**Number of Times:** \_\_\_\_\_

4. Were you not hired for a job?

**Number of Times:** \_\_\_\_\_

5. Were you not given a promotion?

**Number of Times:** \_\_\_\_\_

6. Were you fired?

**Number of Times:** \_\_\_\_\_

7. Were you prevented from renting or buying a home in the neighborhood you wanted?

**Number of Times:** \_\_\_\_\_

8. Were you prevented from remaining in a neighborhood because neighbors made life so uncomfortable?

**Number of Times:** \_\_\_\_\_

9. Were you hassled by the police?

**Number of Times:** \_\_\_\_\_

10. Were you denied a bank loan?

**Number of Times:** \_\_\_\_\_

11. Were you denied or provided inferior medical care?

**Number of Times:** \_\_\_\_\_

12. Were you denied or provided inferior service by a plumber, care mechanic, or other service provider?

**Number of Times:** \_\_\_\_\_

## Appendix D

## Racial Microaggression Scale (RMAS)

Listed below are questions for this section of the survey. Please provide a response for every question.

1. I was ignored at school or at work because of my race/sex/sexual orientation/age/weight/foreign born.
  - 1) I did not experience this event.
  - 2) I experience this about once a year.
  - 3) I experience this about once every few months
  - 4) I experience this about once a week.
  - 5) I experience this about once a day.
  - 6) I experience this about three times a day

2. Please state why you feel you were treated this way or N/A if not applicable.

Personal Response

*Questions below answered as above.*

3. Someone's body language showed they were scared of me, because of my race/sex/sexual orientation/age.
 

1	2	3	4	5	6	7
---	---	---	---	---	---	---
4. Please state why you feel you were treated this way or N/A if not applicable.
5. Someone assumed that I spoke a language other than English because of my race/sex/sexual orientation.
 

1	2	3	4	5	6	7
---	---	---	---	---	---	---
6. Please state why you feel you were treated this way or N/A if not applicable.
7. I was told that I should not complain about issues because of my race/sex/sexual orientation/age/weight.
 

1	2	3	4	5	6	7
---	---	---	---	---	---	---
8. Please state why you feel you were treated this way or N/A if not applicable.
9. Someone assumed that I grew up in a particular neighborhood because of my race/sex/sexual orientation.
 

1	2	3	4	5	6	7
---	---	---	---	---	---	---
10. Please state why you feel you were treated this way or N/A if not applicable.
11. Someone avoided walking near me on the street because of my race/sex/sexual orientation/age/weight.
 

1	2	3	4	5	6	7
---	---	---	---	---	---	---
12. Please state why you feel you were treated this way or N/A if not applicable.
13. Someone told me that she or he was colorblind.
 

1	2	3	4	5	6	7
---	---	---	---	---	---	---
14. Please state why you feel you were treated this way or N/A if not applicable.
15. Someone avoided sitting next to me in a public space (e.g., restaurants, movie theaters, subways, bus).
 

1	2	3	4	5	6	7
---	---	---	---	---	---	---
16. Please state why you feel you were treated this way or N/A if not applicable.
17. Someone assumed that I would not be intelligent because of my race/sex/sexual orientation/age/weight.
 

1	2	3	4	5	6	7
---	---	---	---	---	---	---
18. Please state why you feel you were treated this way or N/A if not applicable.

19. I was told that I complain about my race/sex/sexual orientation/age/weight/foreign born/social class.  
1      2      3      4      5      6      7
20. Please state why you feel you were treated this way or N/A if not applicable.
21. I received substandard service in stores because of my race/sex/sexual orientation/age/weight/foreign born.  
1      2      3      4      5      6      7
22. Please state why you feel you were treated this way or N/A if not applicable.
23. I observed people of my race in prominent positions at my workplace or school.  
1      2      3      4      5      6      7
24. Please state why you feel you were treated this way or N/A if not applicable.
25. Someone wanted to date me only because of my race/sex/sexual orientation/age/weight/foreign born.  
1      2      3      4      5      6      7
26. Please state why you feel you were treated this way or N/A if not applicable.
27. I was told that people of my race/sex/sexual orientation/age/weight/foreign born/social class/other  
. 1      2      3      4      5      6      7
28. Please state why you feel you were treated this way or N/A if not applicable.
29. My opinion was overlooked in a group discussion because of my race/sex/sexual orientation/age/weight.  
1      2      3      4      5      6      7
30. Please state why you feel you were treated this way or N/A if not applicable.
31. Someone assumed that my work would be inferior to people of other racial groups.  
1      2      3      4      5      6      7
32. Please state why you feel you were treated this way or N/A if not applicable.
33. Someone acted surprised at my scholastic or professional success because of my race/sex/sexual orientation.  
1      2      3      4      5      6      7
34. Please state why you feel you were treated this way or N/A if not applicable.
35. I observed that people similar to me were the CEOs of major corporations (similar in race/sex/sexual.  
1      2      3      4      5      6      7
36. Please state why you feel you were treated this way or N/A if not applicable.
37. I observed people similar to me portrayed positively on television (similar in race/sex/sexual orientation.  
1      2      3      4      5      6      7
38. Please state why you feel you were treated this way or N/A if not applicable.
39. Someone did not believe me when I told them I was born in the US.  
1      2      3      4      5      6      7
40. Please state why you feel you were treated this way or N/A if not applicable.
41. Someone assumed that I would not be educated because of my race/sex/sexual orientation/age/weight.  
1      2      3      4      5      6      7
42. Please state why you feel you were treated this way or N/A if not applicable.
43. Someone told me that I was "articulate" after she/he assumed I wouldn't be because of my race/sex/sex.  
1      2      3      4      5      6      7
44. Please state why you feel you were treated this way or N/A if not applicable.
45. Someone told me that all people like me are all the same (similar in race/sex/sexual orientation/age).  
1      2      3      4      5      6      7
46. Please state why you feel you were treated this way or N/A if not applicable.

47. I observed people like me portrayed positively in magazines (similar in my race/sex/sexual orientation).

1      2      3      4      5      6      7

48. Please state why you feel you were treated this way or N/A if not applicable.

49. An employer or co-worker was unfriendly or unwelcoming toward me because of my race/sex/sexual orientation.

1      2      3      4      5      6      7

50. Please state why you feel you were treated this way or N/A if not applicable.

51. I was told that discrimination for people like me does not exist anymore (similar in race/sex/sexual).

1      2      3      4      5      6      7

52. Please state why you feel you were treated this way or N/A if not applicable.

53. Someone told me that they "don't see color."

1      2      3      4      5      6      7

54. Please state why you feel you were treated this way or N/A if not applicable.

55. I read popular books or magazines in which a majority of contributions featured people from my race.

1      2      3      4      5      6      7

56. Please state why you feel you were treated this way or N/A if not applicable.

57. Someone asked me to teach them words in my "native language."

1      2      3      4      5      6      7

58. Please state why you feel you were treated this way or N/A if not applicable.

59. Someone clenched her/his purse or wallet upon seeing me because of my race/sex/sexual orientation/age.

1      2      3      4      5      6      7

60. Please state why you feel you were treated this way or N/A if not applicable.

61. Someone assumed that I would have a lower education because of my race/sex/sexual orientation/age/weight.

1      2      3      4      5      6      7

62. Please state why you feel you were treated this way or N/A if not applicable.

63. Someone of a different racial group has stated that there is no difference between the two of us.

1      2      3      4      5      6      7

64. Please state why you feel you were treated this way or N/A if not applicable.

65. Someone assumed that I would physically hurt them because of my race/sex/sexual orientation/age/weight.

1      2      3      4      5      6      7

66. Please state why you feel you were treated this way or N/A if not applicable.

67. Someone assumed that I ate foods associated with my race/sex/sexual orientation/age/weight/foreign born.

1      2      3      4      5      6      7

68. Please state why you feel you were treated this way or N/A if not applicable.

69. Someone assumed that I held a lower paying job because of my race/sex/sexual orientation/age/weight.

1      2      3      4      5      6      7

70. Please state why you feel you were treated this way or N/A if not applicable.

71. I observed people like me portrayed positively in movies (similar in race/sex/sexual orientation/age).

1      2      3      4      5      6      7

72. Please state why you feel you were treated this way or N/A if not applicable.

73. Someone assumed that I was poor because of my race/sex/sexual orientation/age/weight/foreign born/so.

1      2      3      4      5      6      7

74. Please state why you feel you were treated this way or N/A if not applicable.

75. Someone told me that people should not think about differences anymore in race/sex/sexual orientation.

1      2      3      4      5      6      7

76. Please state why you feel you were treated this way or N/A if not applicable.

77. Someone avoided eye contact with me because of my race/sex/sexual orientation/age/weight/foreign born.

1      2      3      4      5      6      7

78. Please state why you feel you were treated this way or N/A if not applicable.

79. I observed that someone like me is a government official in my state (similar in race/sex/sexual orientation).

1      2      3      4      5      6      7

80. Please state why you feel you were treated this way or N/A if not applicable.

81. Someone told me that all people like me look alike.

1      2      3      4      5      6      7

82. Please state why you feel you were treated this way or N/A if not applicable.

83. Someone objectified one of my physical features because of my race/sex/sexual orientation/age/weight.

1      2      3      4      5      6      7

84. Please state why you feel you were treated this way or N/A if not applicable.

85. An employer or co-worker treated me differently than White co-workers.

1      2      3      4      5      6      7

86. Please state why you feel you were treated this way or N/A if not applicable.

87. Someone assumed that I speak similar languages to other people because of my race/sex/sexual orientation.

1      2      3      4      5      6      7

88. Please state why you feel you were treated this way or N/A if not applicable.